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**LIPID CONSTITUENTS , SURFACE
ACTIVITY AND EMULSIONS
OF PALM OIL**

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**HAMSI AH BT. MOHAMAD ZAHARI
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UPR

Dedicated to Albert, Jen, Wen,
Shen, my parents, brothers,
sis-in-law and all my nephews
and nieces.



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ABSTRACT

Oil droplets present in the palm oil mill sludge were recovered and analysed. The lipids associated with them were determined to be surface active and when reintroduced into palm oil were able to reduce the interfacial tension of the palm oil/water system significantly. From the composition and quantity of the lipids extracted it was deduced that the oil droplets were indeed formed during the milling process.

Phospholipids and monoglycerides when added to the refined palm oil were found to reduce the interfacial tension of the palm oil/water system. Carotene, diglycerides, fatty acids and cholesterol did not produce any significant lowering of interfacial tension of the oil/water interface at the concentrations studied. The interfacial tensions of the various partially processed palm oil against water increased as the palm oil was refined to a higher degree of purity. Interfacial tension data could also be used to identify palm oil refined using different processes.

In this study an attempt was made to determine the Hydrophilic Lipophilic Balance (HLB) of palm oil. However there was no clear indication of an optimum HLB

for the combination of commercial emulsifiers Tween 40 and Span 40 used and HLB of palm oil. Tween 40 alone was found to be suitable for palm oil emulsification at extremely low concentration of 0.15 wt % in oil.

Palm oil products of diverse viscous and viscoelastic properties can be formed with water and Emuldan, a commercial emulsifier consisting of a mixture of monoglycerides. The rheological properties did not differ significantly when compared to the binary system of Emuldan in water where lamellar liquid crystalline structures were observed.

ABSTRAK

Minyak yang berada di dalam sisa kilang minyak kelapa sawit dipulihkan dan dianalisa. Lipid yang terdapat dari titisan minyak ini mempunyai ciri aktif permukaan dan apabila ditambah semula kepada minyak sawit, ia boleh mengurangkan ketegangan antara muka minyak sawit/air. Dari komposisi dan kuantiti lipid yang diekstrak disimpulkan bahawa titisan minyak ini dibentuk semasa proses pengilangan minyak sawit.

Fosfolipid dan monogliserida bila dicampurkan dalam minyak kelapa sawit bertapis dapat mengurangkan ketegangan antara muka minyak sawit/air. Manakala karotin, digliserida, asid lemak dan kolesterol tidak menunjukkan kesan pengurangan ketegangan antara muka. Ketegangan antara muka minyak sawit dari pelbagai proses penapisan meningkat dengan peningkatan ketulenan minyak sawit terproses. Pengukuran ketegangan antara muka mungkin boleh digunakan untuk mengenal pasti proses penapisan yang digunakan untuk menghasilkan pelbagai minyak sawit yang ditapis.

Penyelidikan juga dibuat untuk menentukan "Hydrophilic Lipophilic Balance" (HLB) minyak sawit. Bagaimanapun tahap HLB optima untuk campuran pengemulsi Tween 40 dan Span 40 tidak diperolehi. Pengemulsi Tween 40 didapati sesuai untuk

pengemulsian minyak sawit pada kepekatan 0.15 % dalam minyak sawit.

Pelbagai nisbah campuran sistem penduaan Emuldan/air menghasilkan produk yang mempunyai kelikatan ciri dan kelikatan kekenyalan yang berbedza. Ia juga menghasilkan struktur "lamellar liquid crystalline" yang dikenal pasti dengan mikroskop polarised. Sistem ternari Emuldan/air minyak sawit juga menunjukkan kelikatan dan kelikatan-kekenyalan yang hampir sama sistem perduaannya.

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